

Experimental validation of compatibility for heterogeneous DMT transmitters

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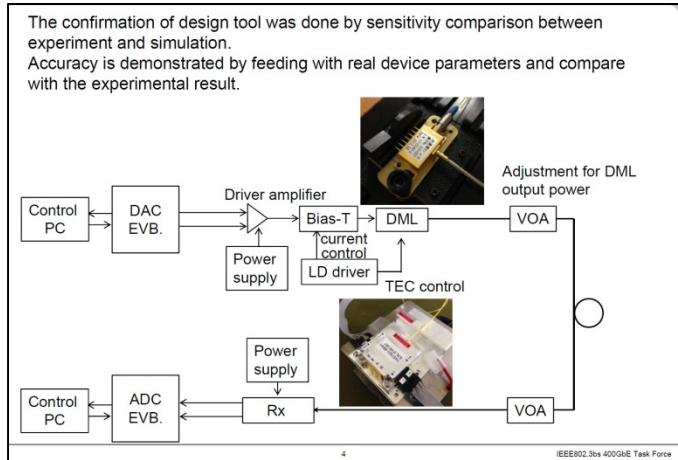
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Supporters

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- Moon Soo Park OE Solutions
- Sven Krueger Huber+Suhner Cube Optics
- Hideki Isono Fujitsu Optical Components
- Ian Dedic Socionext
- Markus Weber Socionext
- Paul Little Socionext
- Patricia Bower Socionext
- Brian Teipen ADVA optical Networking

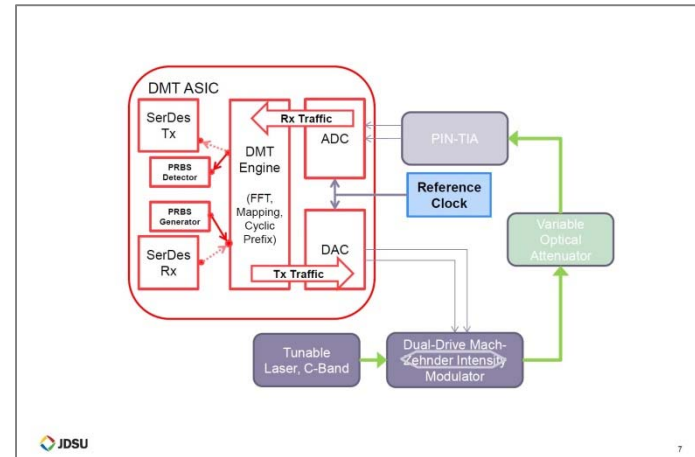
- Various configurations were proposed from several parties.

Directly modulated laser



takahara_3bs_01a_0914

LiNbO₃ Mach-Zehnder Modulator



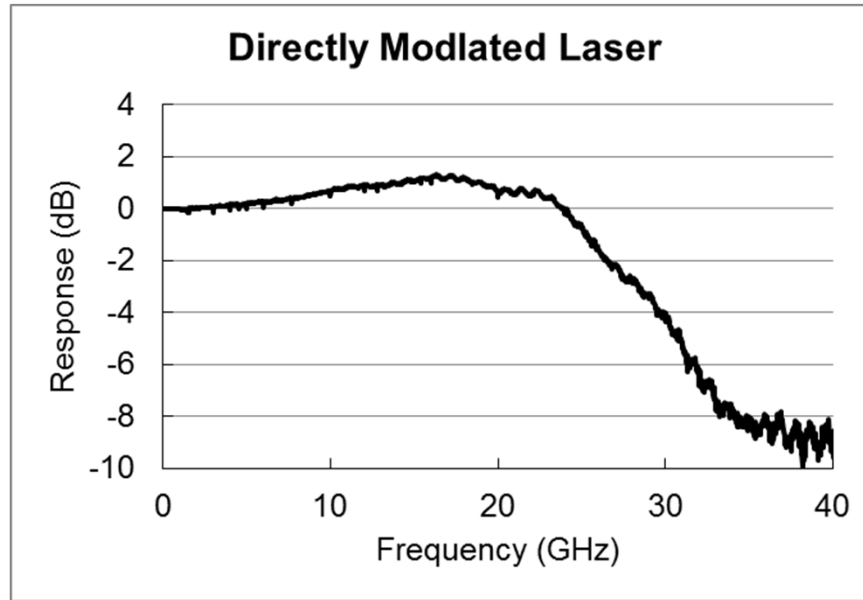
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Each party had submitted many contributions based on considerable amount of measured data.

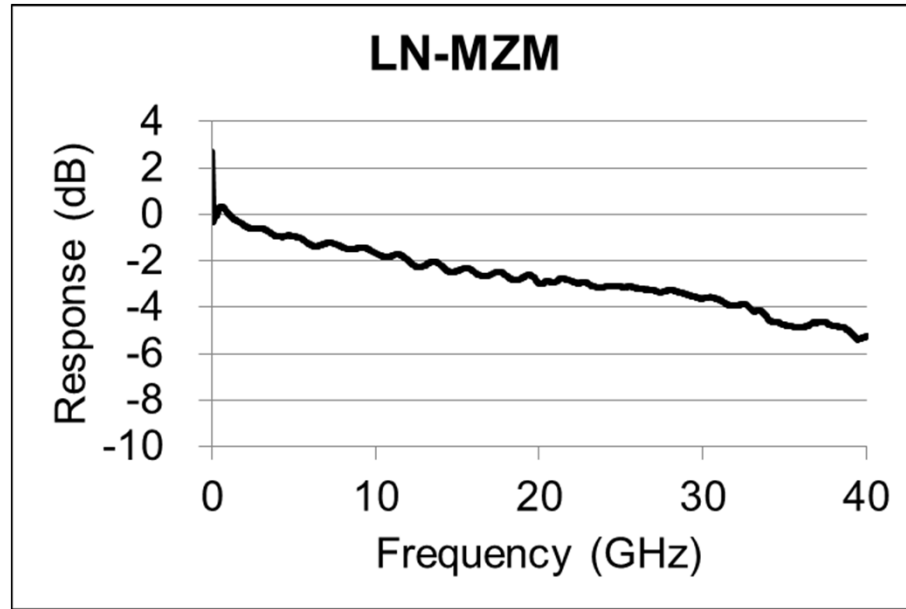
Nevertheless there were slightly differences in their proposals, especially in transmitters.

We try to confirmed the influences of such difference.

For this purpose we prepare commercial LN-MZM for this measurements.



- 3 dB Bandwidth: ~ 28.4 GHz
- Chirp parameter: ~ 1.6



We purchased LN-MZM from general market for this measurement.

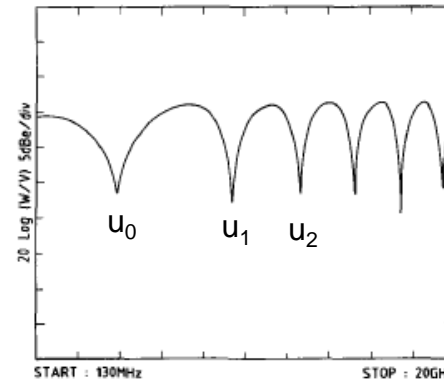
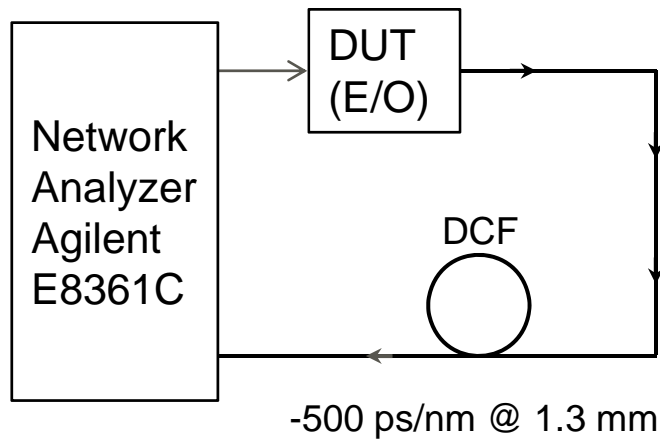
Photoline LN (7525-15)

- 3 dB Bandwidth: ~ 22 GHz
- Chirp parameter: ~ 0.05

Big difference was observed in the frequency response between DML and LN-MZM.

Frequency chirp of transmitters were measured by fiber response method.

$$f_u^2 L = \frac{c}{2D\lambda^2} \left(1 + 2u - \frac{2}{\pi} \arctan(\alpha) \right).$$

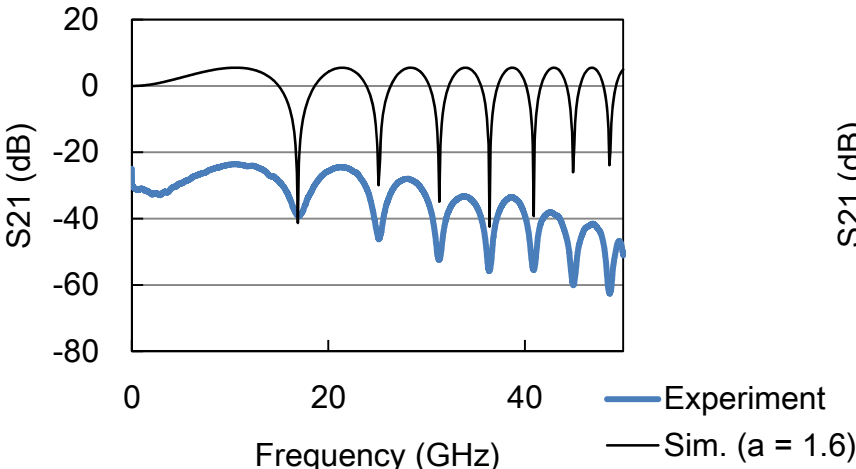


f_u : Frequency at Dip
 L: Fiber length
 c: Light speed
 D: Dispersion
 λ : Wavelength
 α : Chirp

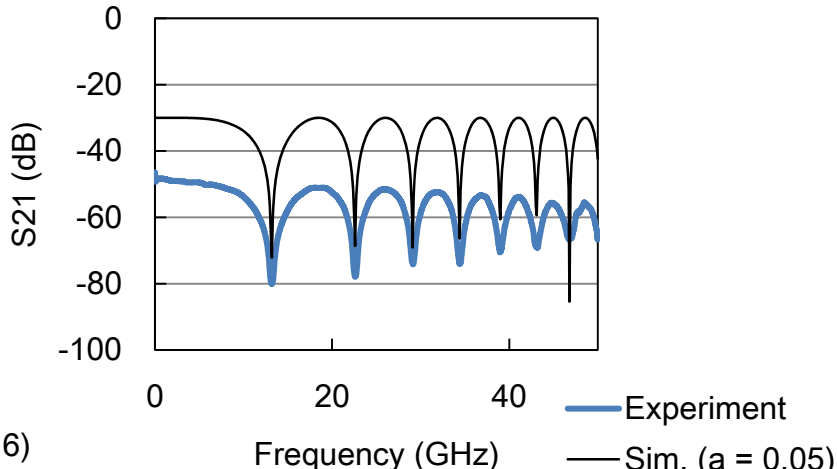
※ F. Devaux et. al., "Simple Measurement of Fiber Dispersion and of Chirp Parameter of Intensity Modulated Light Emitter" JLT, vol.11, no.12, pp. 1937-1940, 1993.

Chirp measurement result

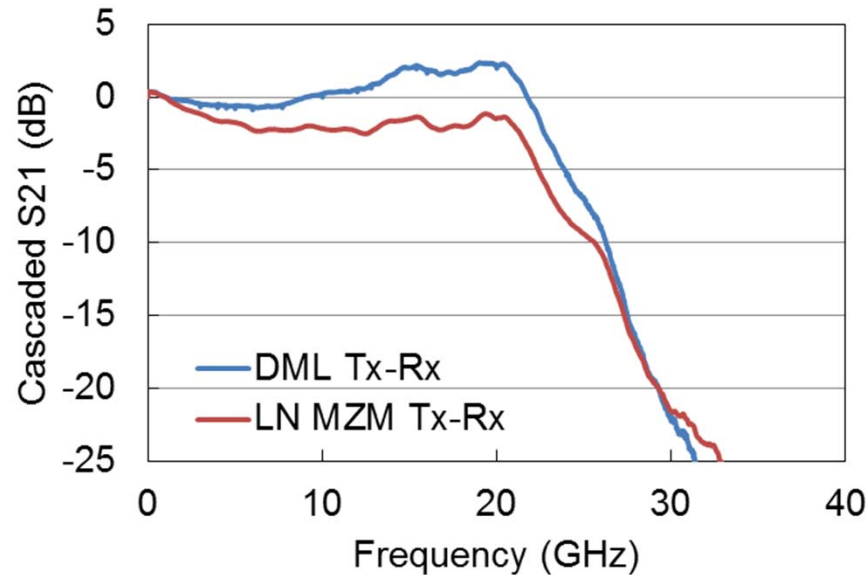
■ DML



■ Photoline LN (7525-15)

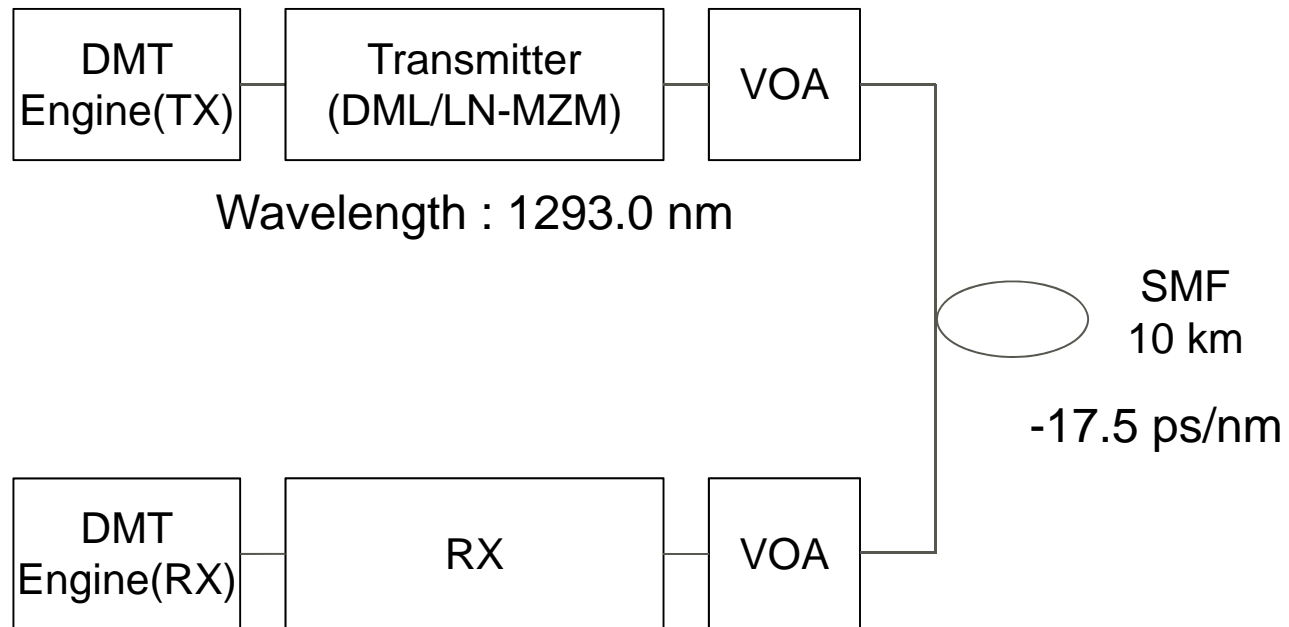


Comparison of cascaded bandwidth

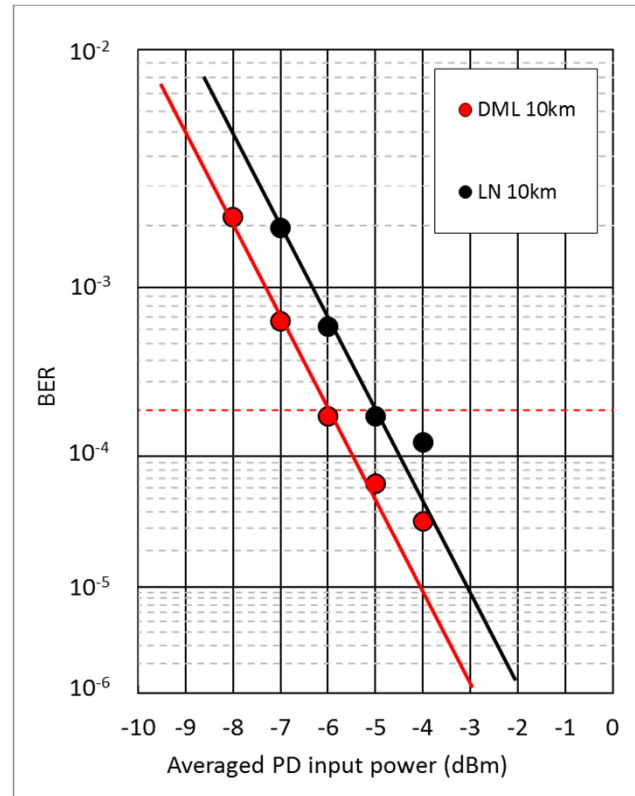


In this measurement, peaking driver was not available.
Therefore LN-MZM cascaded bandwidth was narrower than DML.
Estimated difference of sensitivity is ~ 1.5 dB from numerical simulation result.

■ Measurement setup



Receiver configurations and setting are completely same for both transmitters.



- Sensitivity difference of ~ 1.0 dB was confirmed. This difference is reasonable and is caused by the difference of frequency response of transmitter.
- We confirmed that completely same receiver can be used for different type of transmitters.

- We measured sensitivity characteristics of DMT receiver for heterogeneous transmitters.
- The difference of cascaded band width of transmitter and receiver were caused by the non-peaking driver for LN-MZM.
- Considering the difference, the difference of sensitivity was reasonable. Further this difference will be cancelled by the appropriate peaking driver
- It is evident from the data that interchangeability of transmitters supports interoperability of DMT.

Thank you